

CLAIMS

We claim:

1. A valve comprising:
a first valve component connectable to one of either a fuel supply or a fuel cell,
5 a second valve component connectable to the other of either a fuel supply or a fuel cell,
wherein each valve component comprises a housing and a biased slidable inner body,
and wherein the slidable inner body cooperates with a sealing member to form an internal seal
in each valve component, and wherein during connection the first valve component and the
second valve component form an inter-component seal at least before the internal seals open to
10 create a fluid flow path through the valve.
2. The valve of claim 1, wherein the first valve component is connected to the fuel supply
and the second valve component is connected to the fuel cell.
- 15 3. The valve of claim 1, wherein the first valve component is connected to the fuel cell
and the second valve component is connected to the fuel supply.
4. The valve of claim 1, wherein the slidable inner body is a sphere.
- 20 5. The valve of claim 1, wherein the slidable inner body comprises a pushrod.
6. The valve of claim 1, wherein the slidable inner body is biased by a spring.
7. The valve of claim 6, wherein the spring is made from stainless steel.
- 25 8. The valve of claim 6, wherein the spring is made from an elastomeric material.
9. The valve of claim 8, wherein the elastomeric material comprises ethylene propylene,
nitrile rubber, ethylene propylene diene methylene terpolymer or fluoro-elastomer.
- 30 10. The valve of claim 8, wherein the spring has a substantially straight sidewall.

11. The valve of claim 8, wherein the spring has substantially wavy sidewall.
12. The valve of claim 6, wherein the spring constants of the spring in the valve
5 components are substantially the same.
13. The valve of claim 6, wherein the spring constants of the spring in the valve components are substantially different.
- 10 14. The valve of claim 13, wherein the spring constant of the spring in the valve component connected to the fuel cell is lower than the spring constant of the spring in the valve component connected to the fuel supply.
15. The valve of claim 1, wherein the sealing member is an o-ring.
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16. The valve of claim 15, wherein the internal seal is located between the o-ring and the slidable inner body.
17. The valve of claim 1, wherein the sealing member is a sealing face.
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18. The valve of claim 17, wherein the sealing face is positioned on a front surface of the slidable inner body and the internal seal is located between the sealing face and a portion of the housing.
- 25 19. The valve of claim 18, wherein the portion of the housing is a lip.
20. The valve of claim 17, wherein the sealing face is positioned on the housing and the internal seal is between the sealing face and the slidable inner body.
- 30 21. The valve of claim 1, wherein the sealing member is an elastomeric ball.

22. The valve of claim 1, wherein the inter-component seal is formed by a portion of the housing of the first valve component and the sealing member of the second valve component.

23. The valve of claim 1, wherein the inter-component seal is formed by a portion of the housing of the second valve component and the sealing member of the first valve component.

24. The valve of claim 1, wherein the inter-component seal is formed between the housing of the first valve component and the housing of the second housing component.

25. The valve of claim 1, wherein the inter-component seal is formed before any internal seal opens.

26. The valve of claim 1, wherein the inter-component seal is formed after the internal seal of the valve component connected to the fuel cell opens.

27. The valve of claim 1, wherein the fluid flow path comprises the space between the housing and the slidable inner body.

28. The valve of claim 27, wherein the fluid flow path further comprises at least one channel defined on the slidable inner body.

29. The valve of claim 1, wherein the fluid flow path comprises at least one channel defined on one of the slidable inner bodies.

30. The valve of claim 1, wherein the fluid flow path comprises a plurality of channels defined on the slidable inner body of both valve components.

31. The valve of claim 1, wherein the valve further comprises a liquid retention material surrounding the first and second valve components.

32. The valve of claim 1, wherein the valve further comprises a liquid retention material within at least one of the valve components.

33. The valve of claim 32, wherein the filler material is located in the downstream direction
5 from the internal seal of the valve component.

34. The valve of claim 1, wherein the valve further comprises a retainer to keep the two valve components in the connected position.

10 35. The valve of claim 34, wherein the retainer is a snap-on retainer.

36. The valve of claim 34, wherein the retainer comprises a spring arm connected to the first valve component, a head disposed at the end of the arm and a receiving cavity defined on the second valve component, said cavity is sized and dimensioned to receive said head.

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37. The valve of claim 1, wherein one of the internal seals is opened by a pump.

38. The valve of claim 1, wherein one of the internal seals is provided by a pump.

20 39. The valve of claim 1, wherein at least one of the valve components comprises a second internal seal.

40. The valve of claim 39, wherein the second internal seal is provided by a closed washer.

25 41. The valve of claim 39, wherein the second internal seal is provided by a duckbill valve.

42. The valve of claim 41, wherein the duckbill valve is sized and dimensioned to limit access to said valve component.

30 43. The valve of claim 1, wherein the housing of at least one valve component comprises a nozzle sized and dimensioned to limit access to the internal seal.

44. The valve of claim 1, wherein the housing of at least one valve component comprises a sleeve covering the housing and the sleeve is sized and dimensioned to limit access to the internal seal.

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45. The valve of claim 1, wherein the fuel supply comprises a fuel cartridge.

46. The valve of claim 1, wherein the fuel supply comprises a fuel container.

10 47. The valve of claim 1, wherein the fuel supply comprises a fuel line.

48. The valve of claim 1, wherein at least one valve component is initially covered by a covering member and the covering member is removed before the valve components are connected to each other.

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49. The valve of claim 48, wherein the covering member comprises a cap.

50. The valve of claim 49, wherein the covering member comprises a film.

20 51. A valve comprising:
a first valve component connectable to one of either a fuel supply or a fuel cell,
a second valve component connectable to the other of either a fuel supply or a fuel cell,
wherein the first valve component comprises a first outer housing and a biased first
sleeve and the first sleeve is slidable relative to the outer housing and to a first filler contained
25 within the first sleeve, and wherein the second valve component comprises a second outer
housing, a second sleeve and a second filler contained within the second sleeve, and
wherein during connection the first sleeve and the second sleeve push each other so that
the first filler abuts the second filler to form a fluid flow path through the valve.

30 52. The valve of claim 51, wherein the first valve component is connected to the fuel
supply and the second valve component is connected to the fuel cell.

53. The valve of claim 51, wherein the first valve component is connected to the fuel cell and the second valve component is connected to the fuel supply.

5 54. The valve of claim 51, wherein the second sleeve is fixed relative to the housing.

55. The valve of claim 51, wherein during connection the first valve component and the second valve component form an inter-component seal.

10 56. The valve of claim 55, wherein the inter-component seal is formed before the fluid flow path is formed.

57. The valve of claim 51, wherein the first slidable sleeve is biased by a spring.

15 58. The valve of claim 51, wherein during connection the first sleeve is pushed back to expose at least a portion of the first filler.

59. The valve of claim 58, wherein the second filler is positioned behind the leading edge of the second sleeve to form a cavity in the second sleeve.

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60. The valve of claim 59, wherein the exposed portion of the first filler is sized and dimensioned to be received in said cavity.

25 61. The valve of claim 51, wherein the second filler is positioned behind the leading edge of the second sleeve to form a cavity in the second sleeve.

62. The valve of claim 51, wherein the valve further comprises a liquid retention material positioned spaced apart from the fluid flow path.

30 63. The valve of claim 62, wherein the liquid retention material comprises hydrophilic material.

64. The valve of claim 62, wherein the liquid retention material comprises liquid swellable material.

5 65. The valve of claim 62, wherein the liquid retention material comprises additive.

66. The valve of claim 65, wherein the additive mixes with the fuel.

67. The valve of claim 62, wherein the liquid retention material disposed in the annular area
10 between the outer housing and the sleeve in at least one of the valve components.

68. The valve of claim 51, wherein the valve further comprises a retainer to keep the two
valve components in the connected position.

15 69. The valve of claim 68, wherein the retainer is a snap-on retainer.

70. The valve of claim 68, wherein the retainer comprises a spring arm connected to the
first valve component, a head disposed at the end of the arm and a receiving cavity defined on
the second valve component, said cavity is sized and dimensioned to receive said head.

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71. The valve of claim 51, wherein the housing of at least one valve component comprises a
leading member sized and dimensioned to limit access to the filler.

72. The valve of claim 71, wherein leading member comprises an outer sleeve.

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73. The valve of claim 51, wherein at least one valve component is initially covered by a
covering member and the covering member is removed before the valve components are
connected to each other.

30 74. The valve of claim 73, wherein the covering member comprises a cap.

75. The valve of claim 73, wherein the covering member comprises a film.

76. The valve of claim 51, wherein the fuel supply comprises a fuel cartridge.

5 77. The valve of claim 51, wherein the fuel supply comprises a fuel container.

78. The valve of claim 51, wherein the fuel supply comprises a fuel line.

79. A valve comprising:

10 a first valve component connectable to one of either a fuel supply or a fuel cell,
a second valve component connectable to the other of either a fuel supply or a fuel cell,
wherein the first valve component comprises a housing and a biased slidable inner
body, and wherein the slidable inner body cooperates with a sealing member to form an
internal seal in the first valve component, and the second valve component comprises a
15 duckbill valve;

wherein during connection the housing of the first valve component enters the duckbill
valve to open the internal seal of the duckbill valve, and first valve component and the duckbill
valve form an inter-component seal at least before the internal seals open to create a fluid flow
path through the valve.

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80. The valve of claim 79, wherein a pump opens the internal seal in the first valve
component.

81. The valve of claim 79, wherein the duckbill valve comprises a plurality of wipers that
25 form at least one chamber with the outer surface of the housing of the first valve component
and wherein a pressurized liquid can expand in the chamber.

82. The valve of claim 79, wherein the duckbill valve comprises a retention material to
absorb liquid.

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83. The valve of claim 69, wherein the duckbill valve comprises an additive capable of mixing with the fuel.

84. The valve of claim 79, wherein the second valve component further comprises a housing and a biased slidable inner body, and wherein the slidable inner body cooperates with a sealing member to form an internal seal in the second valve component.

85. A valve comprising:
a first valve component connectable to one of either a fuel supply or a fuel cell,
a second valve component connectable to the other of either a fuel supply or a fuel cell,
wherein the first valve component connects to the second valve component to form a fluid flow path through the valve, and
wherein the valve further comprises a retention material capable of absorbing liquid remaining in the valve when the first valve component disconnects from the second valve component.

86. A valve comprising:
a first valve component connectable to one of either a fuel supply or a fuel cell,
a second valve component connectable to the other of either a fuel supply or a fuel cell,
wherein the first valve component connects to the second valve component to form a fluid flow path through the valve and at least one of the valve components comprises an internal seal and a fluid retention material capable of retaining liquid.

87. The valve of claim 86, wherein the retention material is located in front of the internal seal.

88. The valve of claim 86, wherein the retention material is located in behind the internal seal.

89. A valve comprising:
a first valve component connectable to one of either a fuel supply or a fuel cell,

a second valve component connectable to the other of either a fuel supply or a fuel cell, wherein the first valve component connects to the second valve component to form a fluid flow path through the valve and wherein one of the valve components comprises an internal seal formed by a slidable inner body biased against a sealing member and the other valve
5 component comprises an internal seal provided by a pump.

90. A valve comprising:

a first valve component connectable to one of either a fuel supply or a fuel cell,

a second valve component connectable to the other of either a fuel supply or a fuel cell,

10 wherein the first valve component connects to the second valve component to form a fluid flow path through the valve and at least one valve component comprises an internal seal and a leading member sized and dimensioned to limit access to the internal seal.

91. The valve of claim 90, wherein the leading member is a nozzle.

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92. The valve of claim 90, wherein the leading member is an outer sleeve.

93. The valve of claim 90, wherein the leading member is sized and dimensioned to limit access to the internal seal by a user's finger.

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94. The valve of claim 90, wherein the leading member is sized and dimensioned to limit access to the internal seal the pulp of a user's finger.

95. The valve of claim 90, wherein the inner diameter of the leading member is about 10
25 mm or less.

96. The valve of claim 95, wherein the inner diameter of the leading member is about 5 mm or less.

30 97. The valve of claim 90, wherein the depth of the leading member is about 2 mm or more.

98. The valve of clam 97, wherein the depth of the leading member is about 5 mm or more.